行政院國家科學委員會專題研究計畫 成果報告

台灣大型資訊系統導入與應用之研究--子計畫三:大型資訊系統導入E化能力衡量、作業模式、與組織轉型之研究(3/3)

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子計畫三: 大型資訊系統導入 E 化能力衡量、作業模式、與組織轉型之研究 (3/3)

計畫類別: 整合型計劃

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行政院國家科學委員會補助專題研究計畫期中進度報告

總計畫:台灣大型資訊系統導入與應用之研究

總計劃主持人：李有仁

子計畫三: 大型資訊系統導入 E 化能力衡量、作業模式、與組織轉型之研究

計畫編號： NSC 95-2416-H-004-057-
執行期間：95 年 8 月 1 日至 96 年 7 月 31 日

計畫共同主持人：李有仁、林耀欽

執行單位：國立政治大學資訊管理學系、
元智大學資訊管理系

中　華　民　國　96　年　7　月　31　日

一、摘要：

電子化企業(eBusiness)是管理學界近來研究的主要主題，許多研究都指出未來企業管理的內容與精神將產生根本性的改變。電子化企業與傳統企業最大的不同，乃在於它不僅考慮企業內部的能力因素，它還要考慮企業外部，即其與供應商或客戶間之關係與相互結合的適應能力，而此種能力改變了作業的模式。因此，如何發掘電子化企業中「電子化」能力，與不同產業中不同型態的作業流程的關係，更進而探討組織從傳統企業轉型至電子化企業過程中的變化，並建立一個解釋性的架構，深一層瞭解電子化企業理論建構，誠然是件重要的基礎架構。

因此，本研究的主要研究問題為：

1. 不同的作業模式或型態下應有那些組織因素的變化？

   1.1 不同產業間導入大型系統時，其組織轉型有何不同？

   1.2 在所形成的大型資訊系統導入特色中，導入專案的組織運作會有何關係？

   1.3 不同作業模式型態在導入時對參與成員的角色與態度產生何種影響？其關鍵因素為何？原因為何？

由於大型資訊系統導入所引起之電子化企業 E 化能力評估與管理，尚屬初期發展課題，本研究在方法上以探索性研究設計，以三年期間系統性的探討大型資訊系統在不同產業導入時的上述研究問題，每個產業挑選有接受政府 E 化輔導的公司進行深度的個案研究。

本研究預期建構一個「電子化企業 E 能力、作業模式與組織轉型之解釋架構」，以解釋在不同產業、不同廠商其 E 化能力的衡量與發展設計。

關鍵字：電子化企業、電子化能力、電子化作業模式、電子化能力評估模式、作業模式、組織轉型、大型資訊系統導入

二、計畫之背景及目的

在面對全球化的競爭環境下，所有企業無不全力加強提升本身各方面競爭力的建設。而企業對於資訊科技的建設，如企業資源規劃（Enterprise Resources Planning, ERP）、顧客關係管理（Customer Relationship Management, CRM）和供應鏈管理（Supply Chain Management, SCM）等是近年來常常被提起的議題，但是對於其真正的了解卻又不夠深入。Davenport and Short(1990)指出在90年代，資訊科技的發展強烈的影響企業的運作，並認為企業經常藉由資訊科技來達成內部的需求。而資訊科技也常在企業組織、成員及作業流程上扮演改革者的角色。

由於企業對資訊整合的需求日增，企業開始積極導入ERP、CRM、SCM、

KM、E_LEARNING 等資訊系統，運用資訊科技整合企業資源，成為企業金流、物流及資訊流的流通平台，並以此作為「企業流程再造」（Business Process Reengineering, BPR）、資訊整合的工具及擬定經營策略的依據；而企業的經理人必須對企業內部的作業流程及企業外部的環境有非常深入的了解，並運用資訊科技將所有的資源整合以建立其競爭優勢。這些資源包含企業本身的資訊、技術、財務、人事、物料、生產等，並且結合上、下游成為一個供應鏈模式。

Venkatraman（1991）也指出資訊科技在組織中所扮演的角色已由傳統的支援角色逐漸轉變成為策略性的角色。除此之外，必須能夠在必要時即時提供有用的資訊做為決策之用，否則企業將很難再繼續獲取適當的利益及保持其競爭優勢。也因為如此，許多企業在此時選擇導入策略性資訊系統，以符合時勢之所趨，避免因而失去競爭優勢。

Kalakota & Robinson(1999)認為電子化企業的力量在於顛覆企業流程，對於消費者生活重新改變所造成的社會轉變，遠遠超過以往資訊科技所能達到範圍。不同於傳統企業的經營模式，電子化企業包含由原物料生產的供應商、產品生產製造、顧客銷售與顧客關係管理四者間的運作，透過網路的連結，重新設計對內與對外的企業流程。但如果只是將既有企業程序原封不動的搬到網路上，不但效能無法增加，反而會增加企業成本，因為購置相關機器設備需要經費、維護設備的人員也要錢，再加上把原本人工操作的流程搬到網路上，其實並不會減少人力支出，有時甚至造成工作重複的情形，因此，效率未減反升，也增加許多不必要成本與組織衝突。

因此本計畫期望依所了解之不同作業模式的影響，進而再針對組織在導入大型資訊系統中運用不同的專案組織型態與推動方式，參與成員在導入過程中所扮演的角色與功能加以探討，期望找出不同產業間導入大型系統時，其組織轉型的不同，並建構出資訊系統導入理論的基礎。

三、本年度達成之目標

本年度之目標為了解大型資訊系統導入對組織轉型之影響。本計劃以探索性的研究方法，選定四家正在導入大型資訊系統的企業，深入研究訪談，了解企資訊系統的導入與建置還有其中組織轉型變化的情況。

四家企業及導入系統分別為：東立的全球運籌 e 化系統、雷虎顧客關係管理系統、政府管考資訊系統及政府推動之綠色產品管理系統。探討運輸物流倉儲業(東立)在全球運籌管理營運的概念下，對 e 化系統—業務流程管理(BPM)平台的建置、導入與對企業組織的改變進行探討；了解雷虎科技公司在導入顧客關係管理系統後，對組織的流程與績效有何影響；國內政府在執行相關計畫時，既有的計畫管理方法和資訊系統有何變革需求，組織中應如何因應及智邦科技之供應商在採用綠色產品管理系統時態度上受到什麼樣因素的影響。茲就執行狀況列述如

下：

3.1 全球運籌 e 化大型資訊系統

在政府推廣「佈局全球、深耕台灣」的政策目標下，全球運籌(Global Logistics)不僅能打破地理之限制，並能充分整合產業供應鏈的優勢，並結合資訊技術與系統的輔助，將物流、金流、資訊流與商流作全面的整合，可有效解決企業的經營需求。

本計劃以東立物流作為研究對象，採用深度訪談，探討全球運籌 e 化對經營績效之影響，由於東立物流位於自由貿易港區之台北港，其中作業流程包含：成車進口、汽車零組件捆包出口，與貨櫃調度三項，在資訊科技人員不足的情況下，透過資訊委外的方式進行 e 化系統的建置、作業流程的整合與處理方式，並對企業組織之變化，提出以下現階段的研究發現：

1. 透過資訊委外的力量，協助解決企業資訊科技人力不足的現況，並將資料標準化以加速資料傳遞與處理之速度，同時，透過教育訓練的方式，讓各部門與供應商之間更快速了解新平台的運作模式。
2. 以往過去冗長的人工作業，藉由 e 化的導入後，在作業流程上有助於速度、庫存管理、流程整合、與顧客滿意度管理能力的提升。
3. 導入 e 化後，促使作業流程之資訊加以整合，流程之通透性與完整之支援，大幅提升 20~30%的決策效能。
4. 透過資訊委外導入 e 化，讓企業組織的專業資源專注於本身的核心業務並降低系統開發與總擁有成本。

3.2 顧客關係管理系統

現在企業的經營環境比起過去大為不同，顧客至上的概念是目前企業經營的基本原則，每個企業都致力討好顧客，努力滿足顧客需求，加快回應顧客速率，因此越來越多的企業組織希望藉由顧客關係管理系統來獲取新顧客、增加顧客利潤貢獻與鞏固舊有顧客。但是當大家不斷的認為顧客關係管理系統對企業有很大的效益時，卻沒有具體的指出效益何在以及對企業組織有哪些層面的影響。因此本計畫選擇雷虎科技股份有限公司作為研究對象，採用深度訪談的分是，了解個案公司在導入顧客關係管理系統後，對組織的流程與績效有何影響。

本計畫發現顧客關係管理系統具有資料儲存性、資訊傳遞性以及資訊通透度等三大特性，因此對於組織的五方面流程產生影響，這五大流程分別為開發新客戶流程、銷售流程、產品維修查詢流程、管理流程以及交接流程。以下就各流程進行說明。

開發新客戶流程在導入系統後，透過潛在客戶管理模組與客情維繫管理模組，可改善紀錄顧客資訊的方式。因此業務人員可以快速的查詢到所有與顧客相關的資訊，平均開發新客戶所需時間約縮短 7-14 天。

銷售流程在透過系統的客情維繫管理模組與訊息平台管理模組，可使業務人員於銷售流程中追蹤案件的能力提升，並且可儲存銷售過程中的所有議價紀錄。因而針對不同的案件，進行不同的後續追蹤，平均案件成交率約提昇 10%。

產品維修查詢流程透過系統的客戶服務管理模組，可減少不必要的電話轉接，提供產品維修查詢流程單一窗口化，有助於縮短回應顧客的時間。平均回應顧客時間由過去的 15 分鐘，縮短為目前的 3 分鐘。

管理流程透過顧客關係管理系統六大模組之綜效，使主管於管理部門時，可及時獲得所有部門業務之相關資訊，使主管之管理更為主動，進而提升部門銷售額；在導入系統後，部門銷售額平均提升約 15%。

交接流程透過系統的客情維繫管理模組中的業務移轉功能，使交接流程簡化，並完整的將所有案件資訊移交給新接任人員，平均交接時間由過去的 7-14 天，縮短為 5 天，交接滿意度也由 70%提升至 85%。

3.3 管考資訊系統

現代國家普遍面臨資源有限的困境，基於提高資源運用之效率及成效起見。各國政府莫不建立一套良好的計畫管理機制，以確保計畫能夠順利推動，以達成國家未來發展之需要及人民福祉之目標。且面對現代電腦資訊科技及知識經濟的發展趨勢，政府對於計畫相關的管理機制也必須不斷改良，尤應妥善運用各種科技或知識優點，始能提升政府的競爭力與施政能力，方能讓施政更符合時代及環境需要。

因此如何透過管考資訊系統的優勢來協助計畫發揮既有的功能，符合政府實務需求。本研究針對八家個案，採用深度訪談。主要分析中央部會及地方政府在執行政府計畫時所面臨之問題，並以系統導入後對於組織管理政府計畫過程中有何變革及影響。現階段的研究發現如下：

1. 國家普遍面臨資源有限之狀況，中央承辦單位需貫徹計畫管理流程一貫化與標準化，並與各個機關組織達成共識、加強雙方交流。
2. 中央政府之計畫承辦單位，其原有的組織運作應遵循中央既定規範，並將計畫分為數個階段以利於管理。
3. 管考資訊系統的導入，可提升政府組織管控計畫之能力。已從過去的公文紙本之往返、資料彙整之人力需求轉變成電子化作業。並可有效的整合各個補助機關，使得組織之間的計畫資訊更加流通且透明化。也彌補原有中央與地方對於計畫認知上的落差。
4. 各組織應遵循作業程序標準化與資訊系統的彙整，尋求計畫執行上更加順暢。也使得資訊、流程加以整合，使管考資訊系統的導入對於組織人員在操作上更能貼近計畫實務的流程。

3.4 政府推動之綠色產品管理系統

環境保護及永續發展的意識逐漸抬高，因應這趨勢所引發的產品環境衝擊議

題更是水漲船高，環境議題也迅速的在供應鏈管理中造成很大的影響。本計畫選擇智邦科技股份有限公司之供應商作為研究對象，探討政府輔助國內所設定之標準對綠色供應商之影響，目前在供應鏈體系中作業流程的改變著重於供應商管理之相關流程，因為智邦所屬的網路通訊業，高效率的供應商管理向來為重要的競爭優勢，因為網路通訊產品生命週期短，複雜度高，因此探討綠色供應商對綠色產品管理系統之態度為目前重要之議題。

既有產品綠化概念之興起同時，供應商在供應鏈體系整體產品的供貨能力上具有極高之影響，就綠色供應商其態度上，分三個部份來討論。

環境面：綠色供應商在國內政府第一時間內輔助其提升綠化能力，促使其採用綠色產品管理系統，達到智科科技及國際客戶對綠色產品之需求。此外，藉由智邦科技對綠色供應商之協助，也會提升綠色供應商之供貨能力。

技術面：綠色供應商為改善綠色產品之作業流程，提升綠色產品之知識及加強綠色產品在驗證/稽核上能符合既定之需求，在技術層面上會希冀藉由資訊平台上所提供適用、適切之功能及文件上之分享，因此而促使其採用綠色產品管理系統。

管理面：綠色供應商為能在綠色產品之管理上能了解智邦科技、國內政府、客戶對綠色產品之需求、規格及看法，在態度上傾向強化供應商內部主管綠色產品之能力，亦或智邦指派、調度人力協助其供應商內部能力之不足。此外，希冀能與智邦科技、國內政府及產業內之綠色供應商共同協助，討論而制定出符合供應鏈體系需求並有效降低風險之方法。

四、結論與建議

綜合本年之四個大型資訊系統導入的探討，依本年度之研究問題，我們可以有以下幾項歸納：

1. 不同產業之間在導入大型資訊系統時，各個公司發展的組織應變方式也各有不同。政府組織則需投入更多的協調與會議，建立共識，但成效卻不會立即呈現；企業組織在其內部通常比較有效率來解決導入問題，但在與外部企業之協調上，其成效需賴其他的誘因成能較為有效達成。

2. 不同類型的大型資訊系統在導入時，會受其作業流程改變程度之大小影響。從個案中不論是政府的專案管理系統、或企業內部的供應商管理系統，其作業流程之改變愈大時，導入所產生的資源投入也就會愈大。

3. 大型資訊系統導入時，當參與的成員愈多時，其專案管理的能力就愈為重要。主要廠商在專案管理中所扮演的角色愈積極，一般而言，其最後之績效愈佳。

4. 大型資訊系統在導入時，其作業模式改變較大時，參與成員的影響力較無法發揮，領導者的角色就愈重要。當作業模式改變較小時，參與成員的影響力則較大，但領導者的解色就較淡化。

由於資訊技術已朝WEB 2.0的方向發展，本研究在後續議題上，可再深入探討這些較為個人化傾向的技術，會對企業產生何種深化的影響。

五、已發表的文章

1. 林耀欽，雷虎科技股份有限公司個案，管理評論，已接受，預計十二月底出版；
2. 林耀欽，"物流 E 化對作業流程之影響," 2007 中華民國商業流通研討會,運籌論文集，pp.270~278,2007/05
3. 林耀欽，實現無縫式的物流資訊--東立物流，95 年度國際物流 E 化個案，經濟部商業司出版，2006 年 11 月
4. 林耀欽，擁抱飛翔 遙控全球—雷虎科技，中小企業管理個案集，經濟部中小企業處出版，2006 年 11 月
5. 林耀欽，浩漢產品設計--獨具創意與知識魅力突破重造就無限--13 個成功企業的經營故事，經濟部工業局出版，2006 年 11 月
6. 林耀欽，超高頻 RFID 標籤廠的先行者--創識科技創新關鍵--中小企業升級案例，經濟部中小企業處出版，2006 年 10 月
7. 林耀欽，以行動讓客戶滿意的雷光科技，創新致勝-中小企業成功升級轉型案例，經濟部中小企業處出版，2005 年 10 月
8. 林耀欽，跨越智識與資訊--鼎新電腦股份有限公司，攀登高峰--企業提昇真實案例，經濟部工業局出版， 2005 年 07 月，PP.259-278

行政院國家科學委員會補助國內專家學者出席國際學術會議報告

95 年 6 月 26 日

附件三

報告人姓名	李有仁教授	服務機構及職稱	國立政治大學資管系講座教授
會議 時間 地點	95/6/14-95/6/18 香港	本會核定補助文號	政研發字第 0950004659 號函
會議名稱	（中文)亞太決策科學學會第 11 屆年會 （英文）The Annual Conference of Asia Pacific Decision Sciences Institute(APDSI 2006)		
發表論文題目	（中文）台灣一千大公司之軟體程序管理的縱時性分析 （英文)Software Process Management in Taiwan's Top 1000 Companies: A Longitudinal Analysis （中文）組織公民行為是否影響資訊系統之成功？ （英文）Does Organizational Citizenship Behaviors Lead to Information System Success?		

報告內容應包括下列各項：

一、參加會議經過

本人於 6 月 13 日晚上 12:40 搭乘長榮航空 BR869 赴港，於 14 日 9:20am-11:20pm 出席了以下 Keynote Speeches:

- **Beyond Project Management: IT Leadership in Hong Kong Disneyland**

Mr. Noble Coker, Vice President and Chief Information Officer, Hong Kong Disneyland

- **Choreographing the Customer Experience: The New Role of Operations Strategy**

Professor Aleda Roth, Clemson University, USA

- **Application of the Toyota Production System to healthcare**

Professor Barbara B. Flynn, Wake Forest University, USA; Editor of Decision Sciences Journal of Innovative Education, Associate Editor of Decision Sciences Journal and Journal of Operations Management

並於 11:20am-12:20pm 聆聽 Executive Panel Discussion。15 日之場次中參與 Editor's Panel 及 Research Forum，並參與 APDSI 之理事會與晚宴。16 日之場次中，口頭報告兩場研究論文，並擔任一場博士論文口頭報告之評審。最後於 6 月 16 日下午 9:00pm 搭乘長榮航空 BR858 返國。

二、與會心得

APDSI annual conference is truly the most important conference in the Asia Pacific area. The conference this year is "Innovation and Service Excellence for Competitive Advantage in the Global Environment." The papers presented in the related sessions are very useful for our country in improving competitive advantage in companies. I have learned a lot from the papers presented in this conference. As many companies in Taiwan have partners in China and Southeast Asia, it is vital for these companies to improve their innovation and service excellence.

三、考察參觀活動(無是項活動者省略)

The conference organizer provided a tour to the Chinese University of Hong Kong. The reputation of this university is well established worldwide. The experience of this university is worth learning from by our universities in Taiwan.

四、建議

There were not many participants in the conference who are from Taiwan. We should encourage more Taiwanese scholars to attend this conference.

五、攜回資料名稱及內容

One printed proceedings book and one CD-ROM.

六、其他

無

SOFTWARE PROCESS MANAGEMENT IN TAIWAN'S TOP 1000 COMPANIES: A LONGITUDINAL ANALYSIS

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ABSTRACT

The investment on software and its related products and activities usually accounts for more than 50% of total information technology (IT) budget in a company [33]. It is therefore vital for a company to ensure the quality of software and reduce the cost of software development and maintenance. Since the introduction of capability maturity model (CMM) by the Software Engineering Institute (SEI) in the late 1980s, software developers worldwide have been applying this model to managing their software development process (or "software process" for short) and improving their software product quality. Studies have shown that software process improvement can significantly improve software quality and productivity [10,11,12,20]. The scope of this research project is to take a pulse of the CMM key practices in Taiwan. The project will survey software-developing organizations of top 1000 business companies in this region. The research results could reveal strengths and weaknesses of organizations in Taiwan and help them in prioritizing their actions and allocating their resources to the improvement of their national SPM status effectively. The results will be analyzed in three stages. First is to analyze the maturity status of software process management of the subject group. Second is to compare the data with historical data from Taiwan reported by Li et al. [23,24]. Third is to compare the data with those from Japan and the U.S. to report a comparative analysis in order to identify the strengths or weaknesses. Finally, the implications and future research for software process managers in Taiwan will be discussed.

Keywords: Software process management, capability maturity model, key practice, continual process improvement, software quality, productivity management, longitudinal study.

Acknowledgment: This research is partly supported by the research grant from the National Science Council of the Republic of China, NSC-92-2416-H-155-034.

表 Y04

INTRODUCTION

Software and its related products have been a significant portion of the information technology (IT) budget in a company today [17,32]. The importance of software quality can never be overemphasized. To this end, the U.S. Department of Defense contracted Carnegie Mellon University in December 1984 to set up and operate the Software Engineering Institute for the purpose of advancing the practice of software engineering. Since then SEI has been promoting the evolution of software engineering from an ad hoc and error-prone process to a discipline that is well managed and supported by technology. In 1987, SEI proposed a software process maturity framework [16]. Four years later, they announced the first version of Capability Maturity Model (CMM) [27]. Later in 1993, the latest version of the model, CMM 1.1 [28], was released. Since the emergence of the software process maturity framework in 1987, IT organizations around the world have been taking note of this promising concept. The IT organizations in Taiwan joined the bandwagon in 1996 when the Bureau of Industry at the Ministry of Economic Affairs commissioned the Software Industry Productivity Task Force (SIPTF) to increase the institutionalization of CMM practice in Taiwan's software industry. The SIPTF adapted SEI's model and created its own Software Development Capability Measurement Model (SDCMM). It further developed and announced its Software Development Capability Measurement Handbook [31] in January 1997. The latest version of this handbook [32], Version 2, was released in July 1998.

Studies have shown that software process improvement can significantly improve software quality and productivity [10,11,12]. The original intent of the CMM was to serve as a tool for the U.S. Department of Defense to benchmark the software process management (SPM) infrastructure of its software contractors. Nevertheless, it may be used to diagnose the software development capability of the IT department/group of a business company and to identify process improvement strategies for improving software product quality [26]. For the purpose of benchmarking and diagnosing, SEI has developed and been applying five methods [4,14,19,26]. Based on the outcome of the assessment, SEI places an organization into one of the five CMM levels. According to the DOD's policy, a software company must achieve a maturity level of three or higher in order to participate in the bidding process of DOD's software contract.

There are many individual success stories [1,2,3,5,6,15,19] reported in the news but only a few studies reviewed the overall status of an industry. Those available are mostly about software industry [12,13,14,19]. Although Humphrey et al. [14] reported data about some Japanese business companies, the only studies to date about the status of business industries as a whole were reported by Li et al. [23,24] for Taiwan's top 1000 companies. Their longitudinal analysis had shed the light on the growth of SPM practices in Taiwan's business industries in the late 1990s. The purpose of this study is twofold:

(1) To take the pulse of the SPM infrastructure of the Taiwan's top business companies and gain insight into their strengths and weaknesses. This would be very helpful for Taiwan government and industries to prioritize their actions and allocate their resources effectively for improving their national SPM status.

(2) To compare the results of this study with those from Li et al. [23, 24] conducted in 1996 and 1999. Because the subject groups surveyed by these studies are identical, this allows us to examine the improvement progress of SPM practices in Taiwan's top 1000 companies.

(3) To compare the results of this study with those of Japan and U.S. software organizations reported by Humphrey, Kitson, and Gale [14], similar to the one performed by Li, et al. This helps us identify the strengths or weaknesses of the responding companies and recommend remedial actions for software process managers in Taiwan.

LITERATURE REVIEW

Humphrey, Kitson, and Gale [14] reported three sets of assessment data, two from the U.S. and one from Japan. The participants in the U.S. were Department of Defense (DoD) organizations, DoD contractors, and commercial organizations. These included 55 projects from 10 organizations that participated in SEI-assessments and 113 projects from over 70 organizations participated in assessment tutorials. The former data set (55 projects) was provided by Humphrey, Kitson, and Kasse [13]. In contrast, the participants in Japan were from over 88 software organizations in 6 Japanese companies. These included many business-application programming groups, a few communications and military suppliers, and two computer manufacturers. Through the assessment tutorials, 196 projects were assessed. In these three data sets, each data point is one set of yes-no responses to the maturity questionnaire regarding a specific software project. The authors found that U.S. software industry in general was quite ahead of its Japanese counterpart, perhaps due to the stringent requirements that the DoD put on its software contractors.

Kitson and Masters [19] conducted software process assessments on 296 projects in 59 organizations during February 1987 through March 1991. Among the organizations assessed, 23% were commercial firms, 51% were DOD contractors, 9% military services, 8% federal agencies, and 11% others. They found that 85% of the key practices implemented in this sample to be in level 2 or 3 categories. The five most implemented key practice areas were software product engineering, software project planning, organization process definition, project tracking and oversight, and training programs. The five least ones were process change management, defect prevention, subcontract management, quality management, and peer reviews.

Herbsleb, et al. [12] surveyed 167 organizations and received 138 usable questionnaires. The purpose of their study was to address three questions: "How long does it take, how much does it cost, and how will it benefit an organization to move up a maturity level?," "What are the factors that influence the success and failure of CMM-based software process improvement (SPI)?," and "Is the CMM an appropriate framework for guiding improvements in a way that can be understood and applied to the full variety of software organizations?" All surveyed organizations were at the level-one to level-three, Initial level to Defined level. The authors found that most organizations do not think that CMM-based SPI was counterproductive (96%), neglecting non-CMM issues (90%), or making an organization rigid and bureaucratic (84%). Both of the aforementioned studies did not report the implementation frequency of any key practice. Their data points are not useful for our research purposes, thus will not be analyzed in this study.

Li, Chen, and Lee [23] surveyed the top 1000 Taiwanese business companies in 1996 and reported their CMM key practices based on 138 respondents. They compared their findings with those of Humphrey, Kitson, and Gale [14] in order to identify the weaknesses of the companies. They concluded that SPM in Taiwan's top companies is still in its infancy stage. These companies lagged behind their counterparts in Japan and the U.S. in many key practices even almost a decade later.

表 Y04

Li, Chen, and Lee [24] repeated their 1996 survey in 1999 to conduct a longitudinal study. Based on the data from 101 respondents, they found that the percentages of key practices implemented by Taiwanese business companies are increasing, that most (77 of 89) key practices show increased implementation, and that most of the major weaknesses found in the 1996 survey have been improved significantly

RESEARCH METHOD

The Subjects

The subjects for this study were the top 1000 companies listed in a recent *Directory of Large Corporations in Taiwan* published by China Credit Information Service, Ltd., Taipei, Taiwan. The sample included 622 manufacturing and 378 service companies. The CMM questionnaire was sent twice to the IT executive in each of the sampled companies. The executive was implored to direct the questionnaire to someone who has expert knowledge about the software development practices in the company. Our questionnaire also indicated that additional experts should be consulted if a single individual could not answer all the questions. The first wave of mailing resulted in 65 responded questionnaires. Four weeks later, the second wave of mailing went out to the non-responding companies and attracted 33 more respondents. At the end of the tenth week, we received in total 98 responded questionnaires. However, five of them contained excessive missing or inconsistent data and were excluded from the study, giving 93 usable questionnaires and 9.3% response rate.

The Questionnaire

For comparison purpose, this study adopted the questionnaire used by Li et al. [23,24]. The questionnaire contains 89 questions while the original questionnaire measuring the CMM level contains only 85 questions [16]. The additional four questions were developed by Li, et al. in order to eliminate the ambiguity and insufficiency of the original questionnaire. Three original questions were modified into two questions each and one new question was added to the questionnaire. The respondent was asked to check each "yes" box only if the key practice in question has been a standard practice in his/her organization.

Procedure

Under the circumstance that a company is being certified for the eligibility of contracting a DOD’s software project, an SEI-trained team from the sponsoring organization must conduct CMM benchmarking on various software projects via site visits. This formal procedure eliminates the Hawthorn effect [30] encountered in the self-reporting survey at an assessment tutorial. Nonetheless, assessment tutorial method is an effective and less-expensive way of collecting large sample of data. In this study, we employed the approach used by Li, et al. in which they adapted the assessment tutorial method into a mail survey method and replace the needed tutorial session with a self-paced tutorial document. This document was included in the mailing along with the survey questionnaire. We expect the data provided by our participants should reflect closely the actual SPM status of the companies for the same reasons as Li, et al. identified. Further validation of the data is reported in the next section.

Data Validation

The first step to assure the validity of the data is to examine non-response bias and data representativeness. For the non-response bias, the usable data collected from the first-wave of mailing and those from the second wave were tested. No significant difference was found at the 95% confidence level, indicating the absence of the bias. Subsequently, the data representativeness was examined by testing the differences in demographic distributions between the population (1000 companies) and the usable sample (93 respondents). No significant difference was found (at the 95% confidence level) in terms of company size (including annual sales and number of employees) and industry type. All these results support the quality and the representativeness of the response data.

RESULTS AND DISCUSSION

The top companies in Taiwan have implemented on average 39.0% of the 89 key practices of CMM. Comparing to 35.4% in 1996 and 43.7% in 2000 reported by Li, et al. [24]. The standard deviation is much higher than the previous two periods. That is, the differences in the percent of key practices implemented among the sampled companies are higher in this study than in the 1996 and the 2000 studies. Figure 1 exhibits the profile of key practices achieved by the top companies in Taiwan, while Figure 2 shows the frequency distribution of the percent of achievement among the respondents. According to Figure 1, there are a group of companies that achieved over 90% of the key practices in this study, while the other two studies show only two companies. This trend is expected to continue for the following reason. The effort of implementing a CMM key practice varies, some are difficult and some are easy. The difficult ones require a lot of resources and special knowledge, in addition to time and effort, to achieve. Not many companies could continue to improve their achievement in SPM practices while more companies are joining the CMM bandwagon. As time goes by, we expect these sampled companies will eventually display a dichotomy pattern on the plot, having one group of high achievers and another group of low achievers with a large gap between the two groups. In fact, the plot of 2000 study already showed a sign of such a pattern and the plot of 2006 study reconfirms this trend. The rationale is that the companies who know what to do and can afford to do in software process improvement would eventually become the top achievers. Those who don’t know what to do and cannot afford to do it would be the low achievers and remain in the lower region on the plot.

表 Y04

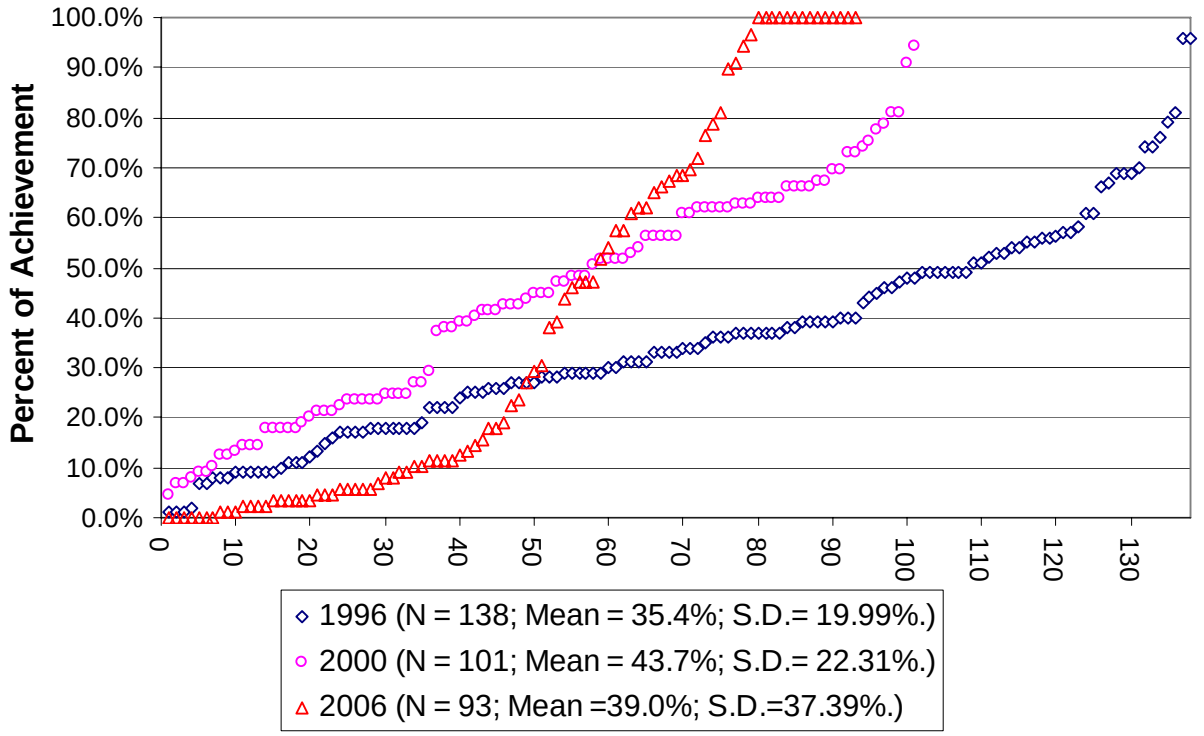

Figure 1. A Profile of Percent of Key-Practice Achievement

Due to the page limit, the remaining contents are omitted. The full version of the paper is available in the CD-ROM version of the conference proceedings.

Does Organizational Citizenship Behaviors Lead to Information System Success?

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ABSTRACT

This study extends the literature and proposes a model to explain why organizational citizenship behavior (OCB) of the IS implementation team could exert a positive effect on information system success (ISS). Specifically, OCB can affect ISS by promoting the cooperative climate between the implementation team and the users and/or by facilitating the project management, which subsequently influence ISS. A survey was used to collect data, and a total of 254 users from 11 firms participated in this study. The results provide support for the proposed model, suggesting that OCB affects ISS through the mediation of cooperative climate and project management. Implications of the study are discussed for researchers and managers.

Key words: Organizational Citizenship Behaviors, Cooperative Climate, Project Management, Information System Success

INTRODUCTION

A significant amount of effort has been directed toward identifying factors that determines the success of information systems. The influence of organizational factors on information systems success (ISS) has received considerable research attention [26]. Despite its being an important factor to the success of information systems [27][32], empirical studies investigating the influence of implementation team remains scarce with few exceptions. A prior study found that similarity among members of the IS development team is positively related to the success of information systems [18]. From the team member's perspective, technical knowledge and process skills such as communications and strategic planning are considered as important determinants of the project process success [44]. Moreover, responsiveness from the implementation team causes the users to give favorable assessment of the information systems and ultimately increase adoption of the

systems [13]. Recent reports reveal that configuration problems account for an estimated 65% of CRM project failures [29] and that the user resistance is one of the major reasons ERP implementation fails [23]. All these findings suggest that user approval is essential for achieving ISS. In this sense, users' judgment toward the systems is a "must-have" criterion to evaluate the information systems, and their evaluations are expected to be affected by their interactions with the implementation team. The important but under-examined influence of implementation team suggest a need to investigate the IS consequences related to the implementation team's interaction with users. Specifically, this study aims to examine whether voluntary behaviors exhibited by the implementation team influence the success of the information systems and the mechanism of such an influence.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Success of information system is determined by many factors, and the determining force may rise at the early stage when the organization implements the system. Implementing a large-scale and cross-functional information system usually constitutes a turbulent and uncertain situation for organizational members including the implementation team and users. For users to adopt a new information system that could changes their work process to a certain extent, the implementation team is critical to make the adoption smooth and effective. In such a situation involving reciprocal interdependence between implementation team and the users, traditional mechanism of coordination (rules, plans, routine, and such) are usually inadequate as contingencies cannot always be properly planned for [19][20]. Furthermore, the coordination between the two parties is a continuous process in which all the actors involved adjust their actions to one another [11] and self-initiated mechanisms of coordination is critical. The behaviors exhibited by the implementation team represent self-initiated conducts that can promote cooperation under the turbulent conditions.

The necessity for employees to extend themselves beyond their formal role requirements in order for the organization to truly perform has been suggested by many other organizational theorists (e.g., [2] [19] [20] [39]). They considered employee's voluntary behaviors, such as cooperative acts, giving ideas for improvement, and promoting a positive climate in the organization, are glue that holds the organization together. Organ [34] terms the voluntary efforts of employees as *Organizational Citizenship Behaviors* (OCB) and suggests that OCB includes activities directed toward other individuals (e.g., coworkers) in the work environment or the organization itself.

Despite of the increasing interests in OCB-related behaviors in the past two decades, the literature reveals a lack of consensus about the dimensionality of this construct [37]. Previous studies have provided evidence that supports the relationship between certain dimensions of OCB and organizational or unit performance, but inconsistencies exist regarding the effects of each dimension. For example, [36] found that *sportsmanship* and *civic virtue* had a positive relationship with work unit performance, but *helping behaviors* related negatively to unit performance. In another study, [37] found that helping behavior and sportsmanship were positively related to unit performance but civic virtue was not related to any measure of unit

performance. In a meta-analysis review of 133 empirical articles that have investigated OCB, [25] found strong relationships among the OCB dimensions. On the basis of this finding, the authors suggests that further research should conceptualize OCB as one latent construct rather than treating the OCB dimensions as distinct constructs [25]. Drawing on this finding and considering the nature of IS implementation, OCB refers to a latent construct that comprises three dimensions.

The first dimension, *helping behavior*, has been the most widely studied OCB dimension [38]. This dimension involves voluntarily helping other with, or preventing the occurrence of, work-related problems. Previous studies have generally confirmed that these two types of *helping behavior* load on a single factor. *Helping behaviors* exhibited by the implementation team include the team's efforts to voluntarily handle/prevent IS implementation-related problems and to help the users learn more about the information system.

The second dimension, *sportsmanship*, is defined as "a willingness to tolerate the inevitable inconveniences and impositions of work without complaining" [33]. In addition, *sportsmanship* also refers to the positive attitude individuals maintain even when things do not go their way, and the willingness to sacrifice one's personal interests for the good of the work group [38]. Given the stressful situation, the implementation team may encounter during planning and execution of the IS implementation, *sportsmanship* would be a necessary component of the team's OCB.

The third dimension, *civic virtue*, represents one's commitment to the organization as a whole, was derived from Graham's [16] discussion of employees' responsibilities as "citizens" of an organization. *Civic virtue* is shown as a willingness to participate actively in the organizational governance and monitor the environment for possible threats and opportunities even at great personal cost, which reflect the employees' recognition of being part of a larger whole. Similar conceptualization is termed as "organizational participation" by Graham [17] and as "protecting the organization" by [14].

Building up on the literature and theories presuming that OCB brings a means to positively influence the measures of organizational performance, we argue that OCB of the implementation team should result in favorable consequences on the success of the information system. Niehoff [31] suggests that OCB exerts its positive influences on organizational performance through the means of socio-emotional support and/or work facilitation. For OCB to relate to ISS, we hypothesize that OCB will increase the socio-emotional support in the organization by promoting the cooperative climate that could also facilitate work process during IS implementation. On the other hand, OCB will increase perceived ISS through work facilitation which is represented by project management effectiveness in this study. Specifically, we propose the following four hypotheses to elaborate the influence of OCB on ISS. Figure 1 illustrates the proposed model and hypotheses.

表 Y04

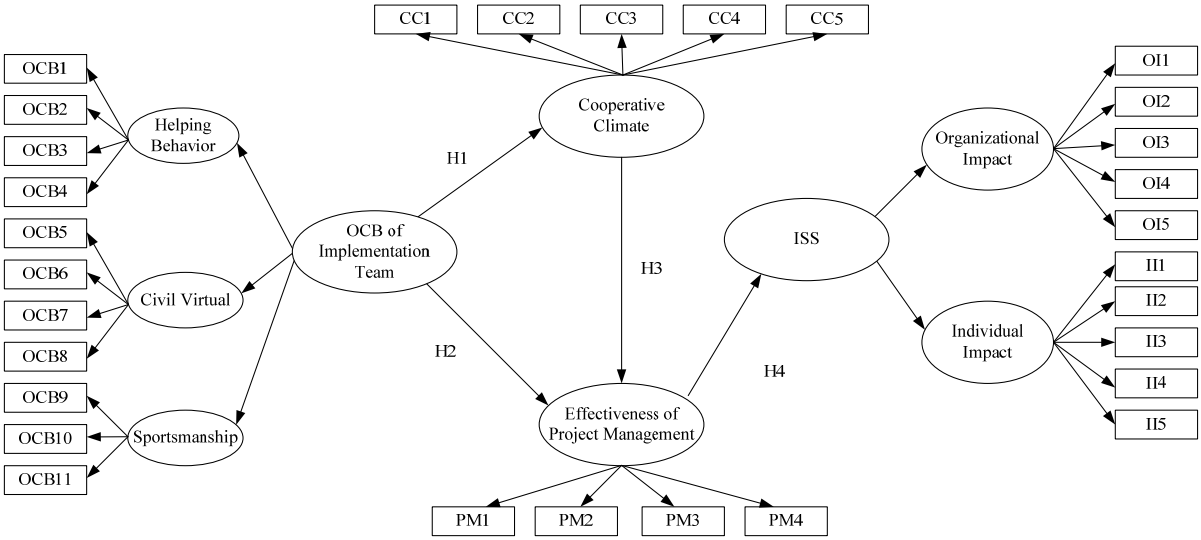

Figure 1: Theoretical Framework

H1: The OCB of the implementation team will positively influence the perceived cooperative climate.

H2: The OCB of the implementation team will positively influence the effectiveness of project management.

H3: The perceived cooperative climate will positively influence the effectiveness of project management.

H4: The effectiveness of project management will positively influence the success of information system

Due to the page limit, the remaining contents are omitted. The full version of the paper is available in the CD-ROM version of the conference proceedings.